WEST

End of Result Set

Generate Collection Print

L6: Entry 1 of 1 File: USPT Nov 27, 2001

DOCUMENT-IDENTIFIER: US 6323846 B1
TITLE: Method and apparatus for integrating manual input

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Brief Summary Text (13):
An ergonomic typing system should require minimal key tapping force, easily distinguish finger taps from resting hands, and cushion the fingers from the jarring force of surface impact. Mechanical and membrane keyboards rely on the spring force in the keyswitches to prevent activation when the hands are resting on the keys. This causes an irreconcilable tradeoff between the ergonomic desires to reduce the fatigue from key activating force and to relax the full weight of the hands onto the keys during rest periods. Force minimization on touch surfaces is possible with capacitive or active optical sensing, which do not rely on finger pressure, rather than resistive-membrane or surface-acoustic-wave sensing techniques. The related art touch devices discussed below will become confused if a whole hand, including its four fingertips, a thumb and possibly palm heels, rests on the surface. Thus, there exists a long felt need in the art tor a multi-touch surface typing system based on zero-force capacitive sensing which can tolerate resting hands and a surface cushion.

Brief Summary Text (14):
An ergonomic typing system should also adapt to individual hand sizes, tolerate variations in typing style, and support a range of healthy hand postures. Though many ergonomic keyboards have been proposed, mechanical keyswitches can only be repositioned at great cost. For example, the keyboard with concave keywells described by Hargreaves et al. in U.S. Pat. No. 5,689,253 fits most hands well but also tends to lock the arms in a single position. A touch surface key layout could easily be morphed, translated, or arbitrarily reconfigured as long as the changes didn't confuse the user. However, touch surfaces may not provide as much laterally orienting tactile feedback as the edges of mechanical keyswitches. Thus, there exists a need in the art for a surface typing recognizer which can adapt a key layout to fit individual hand postures and which can sustain typing accuracy if the hands drift due to limited tactile feedback.

Brief Summary Text (31):
Yet another object of the present invention is to provide tactile key or hand position feedback without impeding hand resting on the surface or smooth, accurate sliding across the surface.

Detailed Description Text (199):
For smaller multi-touch surfaces in which the key layout is permanently printed on the surface, it is advantageous to give the user tactile feedback about the positions of key regions. However, any tactile indicators placed on the surface must be carefully designed so as not to impede smooth sliding across the surface. For example, shallow depressions made in the surface near the center of each key mimicking the shallow depressions common on mechanical keyboard keycaps would cause a vibratory washboard effect as the hand slides across the surface. To minimize such washboard effects, in the preferred embodiment the multi-touch surface provides for the fingertips of each hand a single, continuous depression running from the default index fingertip location to the default pinky fingertip location. This corresponds on the QWERTY key layout to

shallow, slightly arched channels along home row from the "J" key to the ";" key for the right hand, and from the "A" key to the "F" key for the left hand. Similarly, the thumbs can each be provided with a single oval-shaped depression at their default locations, slanted slightly from vertical to match the default thumb orientation. These would preferably correspond to "Space" and "BackSpace" key regions for the right and left thumbs, respectively. Such minimal depressions can tactilely guide users' hands back to home row of the key layout without requiring users to look down at the surface and without seriously disrupting finger chord slides and manipulations on the surface.

Detailed Description Text (200):
The positions of key regions off home row can be marked by other types of tactile indicators. Simply roughening the surface at key regions does not work well. Though humans easily differentiate textures when sliding fingers over them, most textures cannot be noticed during quick taps on a textured region. Only relatively abrupt edges or protrusions can be sensed by the users' fingertips under typing conditions. Therefore, a small raised dot like a Braille dot is formed on top of the surface at the center of each key region. The user receives feedback on the accuracy of their typing strokes from where on the fingertip a dot is felt. This feedback can be used to correct finger aim during future keypresses. Since single finger slides are ignored by the chord motion recognizer, the user can also slide a finger around the surface in tactile search of a particular key region's dot and then tap the key region when the dot is found, all without looking at the surface. Each dot should be just large enough to be felt during tapping but not so large as to impede chord slides across the surface. Even if the dots are not large enough to impede sliding, they can still corrupt proximity and fingertip centroid measurements by raising the fingertip flesh near the dot off the surface thus locally separating the flesh from the underlying proximity sensing electrode. Therefore, in the preferred embodiment, the portion of each dot above the surface dielectric is made of a conductive material. This improves capacitive coupling between the raised fingertip flesh and the underlying electrodes.